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ABSTRACT

In an effort to apply traditional instructional design theories to World Wide Web course development, this qualitative research study examined experiences in Web course design and delivery and explored what components affected Web-based course design. The purpose of the study was to identify and document instructional design attributes of the Web courses that contribute to the comprehension of online instruction and the relationships between these major areas in Web-based courses: instructional design; course development; content delivery; and administrative support. Data were collected through analysis of course materials, interviews with faculty, instructional designers, administrators, and distant learners, and analysis of online instruction activities at three higher education institutions. Four major findings in Web course design provide a base for the teaching and learning transaction: (1) the online instruction should be designed specifically for the distance learners; (2) the design must incorporate phases that are both immediate and long-range; (3) the design of the instruction should be systematic in nature; and (4) the designing of the instruction, and therefore the inclusion of the instructional strategy and delivery mode, must be based upon the knowledge of how the distance student is going to learn. (MES)

Instructional Design Attributes of Web-Based Courses

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Abstract: Revitalized efforts have taken place in the fields of knowledge engineering, expert systems, and multimedia educational technology. The delivery of instruction and instructional materials changed from instructor to students in a classroom, to learners in a certain country or even to students all over the world on the Web. What theory or model can educators follow to design effective instruction for distance learners on the Web? In an effort to apply traditional instructional design theories to Web course development, the researcher conducted a qualitative research study to examine the experiences in Web course design and delivery and to explore what components affected Web-based course design. The purpose of this research study is to identify and document instructional design attributes of the Web courses which contribute to the comprehension of online instruction and the relationships between these major areas in Web-based courses: Instructional design, course development, content delivery, and administrative support.

Introduction

University campuses are changing because of the alternating demographics of their student bodies. The archetypal 18-to-22-year-old undergraduate going through school in four consecutive years and financed by parents is becoming increasingly rare and unconventional. People are taking up their degrees later and over longer periods, assembling them out of one course here and a few credit hours there, snatched between jobs and bank loans, as time, money, interest, and opportunity arise (Brown and Duquid, 1996). Brown and Duquid continued by saying that it is not technology that will cause the changes in the way higher education degrees are offered but rather technology will be very important in the accommodation of an already changing system.

Educational technology in the nineties is a dynamic emerging field. Electronic teaching and learning on the Web are attracting more and more attention from all walks of life. With the help of telephones, fax, computers and Internet, the explosion of information technology has caused the present age to be one of instant communication. Time and distance have been spanned by satellite communications, telelinks and the electronic transmission of texts and images. Information, and the ability to transmit, receive and process it, is increasing rapidly, as are new teaching and learning technologies (UNESCO Principal Regional Office for Asia and the Pacific, 1988).

Three years ago, as an Electronic Instructional Design Specialist, the researcher was designing and editing Web courses for the program of lifelong learning at Ohio University. In an effort to contribute to the knowledge based for creating web-based instruction and as the fulfillment of the Ph.D. program, the researcher conducted a qualitative research study to examine the experiences of faculty, distance learners, instructional designers/developers and distance program administrators in Web course design and delivery. And from their experiences at three sample institutions of higher education, the researcher planned to explore what components affected Web-based course design. This research study investigated and described the relationships between these major areas in Web-based courses: instructional design, course development, course delivery and administrative support.

The purpose of this research study is to identify and document instructional design attributes of Web-based courses, which contribute to our understanding of how to teach online and how to assist distance students learn from the online courses. Consequently from the findings of this study, educators may rethink the process of instructional design, which comes from the traditional instructional design models and theories, but accustoms new features of Web-based courses. Another purpose is to acquire an in-depth understanding about the Web as a mode of delivery in distance education and its effects on distance learning. The research is guided by, but not

limited to the following broad themes identified in a review of literature: instructional systematic design, and teaching and learning on the Web. Besides studying these selected broad themes, this study also explores problems and prospects of online instruction/Web-based learning, which have emerged from the interviews conducted, and the instructional materials examined during the sixteen-month fieldwork.

The Research Study

This qualitative research study included data collection and analysis. Data collection consisted of the multiple sources of data: (1) people; (2) Web sites and instructional materials both print and online; (3) interaction created with online communication tools and required by instructors/professors as well as multimedia technologies used for convey of the course content. The researcher collected data through analysis of course materials, interviews with the faculty, instructional designers, administrators and distant learners from these institutions, and analysis of online instructional activities. All data came from three different settings:

- (1) A state university in the Midwest, whose institutional focus is primarily on traditional teaching, has been offering course by correspondence for years and is new in delivering web courses
- (2) A state college in the north, whose institutional focus is primarily on distance education, has three years of experience offering web courses; and
- (3) A university in the northwest, whose institutional focus is primarily on virtual distance learning, has offered online courses for more than three years.

The researcher contacted the faculty, instructional designers and administrators first. And then according to their willingness, she chose them as interviewees. The participants from the three colleges/universities were ten faculty members who taught courses on the web. Among them two are professors; two are associate professors, three assistant professors, and three instructors. Seven instructional designers or web developers participated the interview - all are full time for online course development, three of them are part-time online course instructors as well. Three distance education program administrators also shared their insight with the researcher in web-based courses management and administrative issues. Since most interviewees from three institutions are located in different states of the country, the researcher interviewed them by email first, and followed up with phone conversations.

Faculty members recommended 32 distance students to the researcher as interviewees. A letter introducing the study and asking for volunteers was sent to these distance students, who were taking the Web courses at the time. The researcher explained to them the purpose and procedures of the study. After these students responded for consent to participation, the researcher emailed the interview questions to all of them. 24 distance students answered the interview questions, talked on the phone or by email messages for follow-up inquiry, and finished the entire interview procedure.

The researcher analyzed three Web-course sites from each college/university. The researcher examined the instructional materials, i.e. course syllabus, online study guides, quiz/test, links to other sites, and other media such as: floppy disc, CD-ROM, videotape, and supplementary printed materials. She also analyzed the opportunities for interaction between student and materials (online, floppy disc, etc); between student and instructor (e-mail, Listserv, Bulletin Board, Chatroom, etc); between student and student (e-mail, Listserv, Bulletin Board, Chatroom, etc); and between instructors and designers. In addition to all the above, the researcher probed the course layout design and use of multimedia technology.

Mathieson's framework for triangulation was used to analyze the phenomena of Web sites, instructional materials, and the insight of professors, distant learners, instructional designers and online course administrators. Data was triangulated where possible, to limit potential bias and data anomalies. The qualitative data collected in this study was analyzed to identify and understand what the strategies are directly affecting the success of a Web course. From the opinions of the faculty members about the instructional emphasis, we educators could reconsider instructional strategies in distance education. From feelings and attitudes of the distance learners, we educational administrators could rethink the effectiveness of assisting adults to learn in the distance. From the preference of delivery technology by distant learners, we instructional designers could develop a better systematic model to accelerate the learning process.

Findings

For the purpose of this research study, the proposition underlying the following section is that consideration must be given to the conditions affecting learning, which are of central importance in Web-based

educational environments. Almost all interviewees discussed the process of applying critical thinking skills in teaching, learning and designing Web-based courses. Critical thinking skills provide to online distance students the capability in problem solving; to instructors making the instructional process tailored to distance student needs, and to course designers the selection of interactive instructional technology most appropriate for the learning situation.

The theories and models of how to design instruction discussed in the literature review (Dick and Carey's systematic design of instruction; Gagne's principles of instructional design; Instructional Development Institute (IDI) Model, and Kemp's model of designing effective instruction) are guidance for the researcher to analyze the Web course sites, instructional materials and the experiences expressed by distance course instructors, distance learners, course designers/developers and administrators in distance learning programs. Even though these theories and models are based on the teaching and learning experience from in-classroom instruction, the major components of instructional design of Web-based courses are the same as those in the classroom. No matter where the course is offered, instructors would always reckon the importance of needs analysis, think about the goals and objectives, consider the student characteristics and previous knowledge, plan the procedure and strategies for instruction, design and conduct formative evaluation and summative evaluation as well. What is missed here are the course designers, learning skills, media and technology used to assist the content delivery. As learning is a process of interaction between the student, instructor and resource materials, the student is central to this process. Even though the student and the instructor/professor in an online course were physically separated, there was still interaction between them. The nature and extent of this interaction depends on the technology adopted, the institutional support provided and the type of resources employed. These are the influential points of course design, which the researcher explored in this research study, to investigate if they affected Web-based course design, and to clarify what relationships existed among the components of the online course development.

Distance students who took Web courses usually have their own career and family. It requires self-discipline, strong motivation and painstaking efforts for them to finish an online course and earn college credits. The most important relationship in web-based learning is the communication and interaction between the instructor/professor and a distance student. Without an instructor, the student will have little guidance and direction in learning a specific discipline. From teaching distance students, instructors/professors become more aware of distance student needs so that they can make instructional changes to meet the needs. With the textbook, online study guide and supplementary materials, distance students grasp the principles and knowledge in the course and use them in their work and life if applicable. Students' comments, reflections and projects form the progress of the online course.

Four major findings in web course design from this research study provide a base for the teaching and learning transaction - planning and designing instruction from face-to-face to online. First, the online instruction should be designed specifically for the distance learners. When planning the course, instructors or professors should consider the characteristics of distance students - who they are, what they are good at, how a subject content is delivered to them, and why the course is taught in a certain way. Second, the design must incorporate phases that are both immediate and long-range. While creating and developing a Web course, faculty and course designers should bear in mind the possible outcomes after the course is offered. Meanwhile, they need to take into account that they are creating a course not only for next semester, but next academic year and the years beyond as well. Because the money, manpower and time faculty, course developers, and the institution invest into a Web course should serve the institution for some time in the future. Third, the design of the instruction should be systematic in nature. No matter what interface design is created and what multimedia elements used, the web-based courses should be designed in a consistent manner, representing the culture of an institution though different subject matters require different technological applications. Meanwhile, these web-based courses should also represent the uniqueness of an instructor/professor's instruction. And the fourth, the designing of the instruction, and therefore the inclusion of the instructional strategy and delivery mode, must be based upon the knowledge of how the distance student is going to learn. That means teaching strategies and delivery technology serve the needs of distance students and the purpose of content delivery instead of distance students having to accommodate "the fancy features" just for the sake of using the cutting-edge technology.

Ironically, no matter what format it is in and even though new technologies have empowered faculty and students to learn more, technology increases distance student separation from the instructor/professor and deepens the learning curve of how to utilize it for both distance students and faculty members. On the other hand, technology is the way to bring distance students together - shorten the distance among students, between them and the professor and reduce the isolation they have when learning on their own. In web-based instruction, distance students are empowered by having more control over what they learn, how they learn, and

when they learn it. From this research study, distance students found that web technology reduced the role of the professor as mediator between the student and all that is learned. However, neither the Web nor the computer would replace professors. Human beings are still in total control of technology.

Conclusions

The growing diversity of the student population and the rapid development of educational technology have encouraged the popularity of web-based instruction. This research provided evidence of the effective features of online instruction in terms of student perceptions of online learning, the changing role of faculty in teaching Web courses, course designers and developers' cooperation and support from distance learning program administrators. The following paragraphs discuss the conclusions of this research study, which supported the research studies discussed in Chapter Two, and at the same time, contributed to the development of instructional design models and theories in Web-based courses.

Attribute I - The instructional design of a Web course differs from the one delivered face-to-face though in both situations instructors use some technology in teaching. However, the Web-based course requires a team effort from instructors, instructional designers and administrators because with the application of technologies (e.g. computer multimedia for course design, server support for course delivery), Web courses are no longer the creation and development of instructors only as they normally do for in-classroom teaching. This team also has a well-constructed instructional plan that has clearly established course goals, objectives, medial resources, support systems, instructional strategies, choice of technological application, and a plan to evaluate the effectiveness of both instructional and technical delivery strategies. Web courses must be organized around the acquisition of the knowledge, skills, understandings, and values that are applicable to students' real life tasks. In Web course design, using appropriate techniques and technology to serve the learning goals is very important, so careful planning and clear guidance should be provided for distance students to have meaningful, satisfying, and realistic objectives to guide their learning activities. Web course designers or developers should make sure that the learning activities and experiences are supplemented and enriched by the use of related materials, Web resources, and online activities. The Web-based course should allow distance students the choices to decide how they are going to learn, when they will learn it, and how they are to verify that they have met the desired objectives.

Attribute II - The effective instruction with technology depends on several interacting elements: the nature of the content to be learned, the feature of the technology used, the cost of delivery, the quality of the learning experience, the time available, and faculty or program ability to respond to students' needs. According to all the feedback from the distance learners interviewed, online instruction is effective, especially when the distance students are engaged interactively in a process of knowledge inquiry, technology application and self-development in learning. The implication of the interaction from the feedback of instructors interviewed is that online instructors should use certain instructional strategies (group project, team work or individualized assignment) to facilitate interactions among students, thus enhancing collaborative learning. This was accomplished among the three colleges and universities in three ways: (1) by designing interaction between the student and the instructor, such as solving an actual "learning problem," (2) by designing interaction among the distance students and between project teams/groups for collaboration, and (3) by designing interaction between the student and the subject matter with certain software (e.g. Micromedia Authorware) designed for this purpose. The distance students engaged in active, real-life learning experiences, which were relevant to one another, and to the problems of home, school, and community.

Attribute III - The effective use of the Web technology lies not in the form, but in its ability to serve specific instructional goals and desired learning outcomes. We can use a variety of delivery techniques to bring about distance learning. The focus must be on learning and what brings it about, not the mechanism of delivery, or the course production techniques. The technology one chooses to use must be compatible with the instructional methods and strategies employed. The underlying consideration for distance learning should not be compromised by the choice of technology. With more new and user-friendly technologies available and larger distance education programs that support more variety and innovative activities in course planning, this is an explicit direction in Web course design and development. However, effective decision-making raises another difficulty as the number of choices grows (Web programming software, multimedia applications, computer equipment, larger servers, etc). The selection of appropriate combinations of feedback options between online professors and distance students (telephone, email, fax, discussion board - asynchronous communication, and virtual chat -synchronous communication) is also within this category of decision-making.

Attribute IV - The faculty members are critical to the success of an institution and to the enrollment of distance students. The researcher concluded that from students' point of view, a "good" instructor or professor,

no matter where they teach and in what mode of delivery, ought to plan for the entire course, organize the teaching methods and materials, and implement effective teaching strategies. Online instructors and professors are certainly required to do more than what is for good classroom teaching. For instance, they need to be a master of using the Web technology in addition to regular course planning and preparation. For Web-based instruction, online faculty members should be aware of and sensitive to the challenges mentioned above; therefore, online instructors should approach Web-based teaching with a predisposition to meeting the challenges with whatever strategies they could find and use.

Attribute V - The most helpful and critical instructional elements for distance students in Web-based learning are (1) timely feedback from an instructor or a professor and (2) the tutorial materials for distance students who have never taken an online course before. From the interviews, the researcher found that online instructors and professors realized the importance of "turn-around time" on discussion and assignments. Before various electronic communication methods were considered and compared, they worked together with instructional designers and course developers, planned their lessons, and implemented feedback into Web courses on the basis of instructional functions to serve the course objective. Then the course designer or developer made use of a certain technology to accelerate the process of timely feedback.

Recommendations

Recommendations for Web Course Design

From the distance learners' perspective, orientation and tutorials (by print or online) should merge for the purpose of preparing distance students to learn online. These tutorial materials should highlight prerequisites of computer hardware and software, survival learning and technical skills, how to navigate the course materials and learn on the Web. Overall, the tutorial should enhance distance students' confidence to complete the course. A careful and thorough course introduction seems to raise non-traditional students' motivation for a successful learning experience.

As for the size of an online class, the ideal one should be similar to that on campus - around 25 to 30 because the faculty members interviewed in this study expressed their difficulties in handling a larger online class. The reason is that if more than 30 distance students engage in online assignments, email correspondence, electronic discussion and virtual chat, the instructor or professor will be overwhelmed by the different demands of the students. The timeliness of online feedback and grading would suffer because all the Web course interactivities mentioned above are time-consuming.

A major question when considering any technology for the delivery of online instruction must be "What type of learning will it assist and how will that shape student learning?" Every technology has its pros and cons. The choice of technology depends on the discipline area, the instructional goals and objectives that distance students are striving to reach, and what purpose that technology serves. Learner feedback must be designed into online courses on the basis of instructional criteria before considering the constraints of a particular delivery technology. This will not only increase the probability of designing feedback of optimal instructional quality, but also avoid the pitfalls associated with concentrating primarily on technological opportunities or limitations.

The maximum interaction among distance students should be fostered by careful consideration in the instructional design, that is, a built-in intention to increase student interaction for an objective of the course. It can also be the case that there is a relationship between types of interaction - learner-content interaction, learner-instructor interaction, and learner-learner interaction. Furthermore, course developers and instructional designers need to pay attention to applying a certain type of interaction to a different course requirement in a certain discipline area. For example, discussion boards can facilitate communication among distance learners; virtual chat can provide distance learners with the opportunity of meeting an expert in the field or the course instructor during the virtual office hour; CD-ROM or Web lab can give distance learners the tool to conduct lab experiments electronically.

Based on the findings and conclusions of this research study, several components in online instruction need special attention. These components are dealing with the underlying issues of distance student characteristics and needs, the influence of multimedia upon the instructional process, and the new roles of professor, Web developer, site facilitator, and non-traditional students in the distance learning process. There should also be continuous and periodic student and program evaluation to assess the progress respectively.

Recommendations for Future Research

The findings of this research study also indicate the need for further research in the areas of motivation and expectancy of distance learners as well as learner-centered instruction. Every distance student interviewed has his/her own reason to take online courses. They were motivated for career promotion, professional improvement and personal growth. They expected someday to function more effectively at work, make more money and feel better about themselves. With all in mind, these distance students (normally with jobs and family) disciplined themselves to find spare time to do the homework and assignments without an instructor pressing on them as in the classroom.

Since this study focused on the attributes of Web course design, the researcher did not spend much time and energy in exploring deeply into the following questions. Are there any other elements related to the motivation and expectancy of distance learners as well as learner-centered instruction mentioned above? What is the nature of these variables? What roles do they play in the successful completion of Web-based courses, and furthermore – an external degree program? More research in the future will add much to our understanding in Web course design and development so that educators can serve distance students better.

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